

1. a) MIDPOINT $(-3, 1)$ B1 B1
 ATTEMPTS TO FIND $|BC|$, $|AC|$ OR $|AB|$ M1
 GIVES $r=5$ A1

b) " $(x+3)^2 + (y-1)^2 = 25$ " B1
 SUBS $x=0$ M1
 SOLVES & SIMPLIFIES QUADRATIC M1
 $a = \begin{matrix} 5 \\ -3 \end{matrix}$ BOTH A1

2. $f'(x) = 1 - 25x^{-2}$ B1 B1 (ONE MARK FOR ATTEMPTING DIFFERENTIATION)

$f''(x) = \frac{50}{x^3}$ B1

" $1 - 25x^{-2} = 0$ " M1 ~~ft~~

SOLVES EQUATION M1

$x = \pm 5$ A1

GIVES FIVE WORDS AS $(5, 20)$ $(-5, 0)$ A1

SUBS INTO $\frac{50}{x^3}$ M1

CONCLUDES $(5, 20)$ IS MIN & $(-5, 0)$ IS MAX A1

3. a) $ar^2 = 4$ OR $ar^5 = 6.912$ B1

SOLVS BY DIVISION OR SUBSTITUTION M1

$r = 1.2 = \frac{6}{5}$ A1 c.u.o

$a = \frac{25}{9}$ A1 c.a.o

b) " $\frac{25(1.2^{10} - 1)}{1.2 - 1}$ " OR SIMILAR M1

72.1... A1

4. $\int x^3 - 4x \, dx$ BI

\int_0^2 BI

$\int_2^{\sqrt{8}}$ BI

$\frac{1}{4}x^4 - 2x^2$ MI

$(4-8) - (0)$ OR $(16-16) - (4-8)$ MI

OBTAINS -4 & 4 AI (both) ← dgp

STATES OR INPUTS BOTH AREAS ARE 4 EI

5.

$2r + r\theta = 33$ BI BI (ONT MARK FOR $r\theta$)

$\frac{1}{2}r^2\theta = 67.5$ BI

ATTEMPT SOLUTION BY SUBSTITUTION MI

$2r^2 - 33r + 135$ OR $15\theta^2 - 61\theta + 60$ AI

$(2r-15)(r-9)$ OR $(3\theta-5)(5\theta-12)$ MI

OR ATTEMPT IN QUADRATIC FORMULA

GIVES CORRECT PAIRINGS

$r=9$ WITH $\theta = \frac{5}{3}$

$r = \frac{15}{2}$ WITH $\theta = \frac{12}{5}$

43 -1 eeo

6. a)

USES GAP $\frac{\pi}{12}$ B1

ATTEMPTS CORRECT EVALUATIONS OF $\cos^2 x$ FOR THEIR x VALUES (AT LEAST 2 NON ZERO VALUES) B1

USES $\frac{\text{THICKNESSES}}{2}$ [FIRST + LAST + 2 \times REST] M1

$$\frac{\pi/12}{2} \left[1 + \frac{1}{4} + 2 \left(\frac{2+\sqrt{3}}{4} + \frac{3}{4} + \frac{1}{2} \right) \right] \text{ M1}$$

0.735 A1

b)

USE OF $1 - \cos^2 x$ B1

SPITS INTO $\int_0^{\pi/3} 1 \, dx$ & $\int_0^{\pi/3} \cos^2 x \, dx$ M1

GIVES $\frac{\pi}{3}$ M1

A.W.R.T 0.312 A1

7.

$\pi - (1.1 + 0.7)$ OR 1.3416° B1

USES SINE RULE TO FIND AC OR BC M1

$$|BC| = 56.229... \text{ OR } |AC| = 77.787... \text{ A1}$$

USES TRIGONOMETRY ON RIGHT ANGLE TRIANGLE WORKS M1 A1

STOPS 50.1112... A1

8. a) SUBSTITUTES $x=1$ INTO $f(x)$ M1
 SHOWS 0 AND CONCLUDES A1

b) $(x-1)(x^2+ax+b)$ M1

$(x-1)(x^2-3)$ M1

$(x-1)(x-\sqrt{3})(x+\sqrt{3})$ A1

c) SHOWS $\tan\theta = 1$ OR $\sqrt{3}$ OR $-\sqrt{3}$ M1

SLOPE OF 45 OR 60 OR -60 M1

$45^\circ, 60^\circ, 120^\circ, 225^\circ, 240^\circ, 300^\circ$ A4 -1 e e o o

9. $x = y^5$ B1

$\log_2\left(\frac{x}{y}\right)$ B1

$\log_2 4$ B1

$\frac{x}{y} = 4$ B1

$y^5 = 4y$ OR $x^5 = 1024x$ M1

$y^2 = 2$ OR $x^2 = 32$ A1

$y = \sqrt{2}$ A1 C.a.o

$x = 4\sqrt{2}$ A1 C.a.o

10. SLOPE OF $\binom{13}{7}$ OR $\binom{13}{6}$ OR IN THE 2ND PART $\binom{1}{7}\binom{14}{6}$ OR $\binom{14}{8}$ M1

a) 1716 A1

b) 3003 A1